

OBJECTIVES

Upon completion of this module, the student will be able to:

1. Define the following terms as they apply to fresh sausage operations:
 - “Fresh”
 - Poultry
 - Sausage
 - Mechanically Separated (Species) Product
 - Meat
 - Meat byproduct
 - Imitation
2. List the five common types of fresh sausage.
3. Describe the purpose and restrictions of these additives.
 - Water
 - Paprika
 - Antioxidants
 - Extenders and binders
4. List the characteristics (Product Standard) of each of the following products:
 - Fresh pork sausage
 - Breakfast sausage
 - Italian sausage
 - Whole hog pork sausage
 - Fresh beef sausage
 - Bratwurst
5. Calculate and determine the following ingredients’ compliance when used in a fresh sausage product:
 - Added water
 - Extenders and binders
 - Antioxidants
 - Mechanically separated (species) product
6. Determine the approximate fat content of a formula (when the fat content of the ingredients is given).
7. List the products and conditions where the treatment of trichina is required.
8. Interpret laboratory sample results for added water.

INTRODUCTION

This module is designed to increase the student's awareness of fresh sausage operations and the characteristics of this type of product. Sausage is a ground or chopped product that is seasoned with condimental substances to obtain the desired taste and flavor. The word "sausage" comes from the Latin word "salsus", which means salted, or preserved by salting.

Fresh sausage is made from selected cuts of fresh and sometimes frozen meats, principally pork; beef and other meats that have not been cured are also used in some fresh sausage products. This type of sausage requires constant refrigeration, and must be thoroughly cooked before serving.

Fresh sausage is not as widely produced as cooked sausage and is normally consumed for breakfast or in breakfast-type meals.

To help the student fully understand fresh sausage production, a few terms will be defined.

Fresh, as applied to this product, means that it does not contain curing agents [i.e., sodium or potassium nitrites or nitrates or salt in sufficient quantities to preserve the product §317.8(b)(6)].

Meat is skeletal muscle tissue of cattle, sheep, swine, goats, or equines. It also includes that muscle tissue found in the diaphragm, tongue, heart, and esophagus--§301.2(rr). For sausage products, the definition of meat differs slightly from the definition of meat given in part 301 of the Regulations. For example, tongues, hearts, and weasands are not considered meat; they are meat byproducts.

Poultry Meat is deboned chicken or turkey meat, or both, without skin or added fat (kidneys and sex glands removed)--§319.180(g).

Meat Byproducts include pork stomachs and snouts; beef, veal, lamb, or goat tripe; beef, veal, lamb, goat, or pork hearts, tongues, fat, lips, weasands, and spleens; and partially defatted pork fatty tissue, or partially defatted beef fatty tissue--§319.180(g).

Sausage is a coarse or finely comminuted meat food product prepared from one or more kinds of meat or meat and meat byproducts, containing various amounts of water and seasoned with condimental proportions of condimental substances--§319.140.

Imitation refers to a product that resembles a standardized product but does not meet the standard for the product it resembles--§317.2(j)(1).

Mechanically Separated (Species) Product is a finely comminuted product resulting from the mechanical separation and removal of most of the bone from attached skeletal muscle of livestock carcasses and parts of carcasses, and meeting the requirement for this product--§319.5.

Note: Mechanically separated (species) product must have a fat content of no more than 30 percent, and may constitute up to 20% of the meat and poultry product portion of the meat food product.

FRESH SAUSAGE PRODUCTS

A number of fresh sausage products are produced; many are specialty items. The most common products in this category are fresh pork sausage (whole hog and country style), fresh beef sausage, breakfast sausage, Italian sausage, and bratwurst.

Of these, Italian sausage is the only one allowed to contain paprika. Paprika is normally prohibited in fresh sausages because of its color-enhancing properties.

Fresh Pork Sausage -- §319.141

This is a product made from fresh or frozen boneless pork cuts and/or pork trimmings with *no* pork byproducts. It may contain mechanically separated pork product at a level of 20% of the *pork* being used in the formula (§319.6). This product is seasoned with condimental substances that are permitted by §318.7 of the Regulations. Most condiments are permitted at a level sufficient for purpose, and are mainly used as part of an operator's special formula. Sage and pepper are widely used in this type of product. Paprika, extenders, and binders are not permitted. To facilitate chopping, and mixing of the spices and flavorings, water and/or ice may be used in this product at a 3% level of the *total ingredients*. The total fat content shall not exceed 50% of the finished product.

- Farm or country style pork sausage

When these designations are used, all spices and flavorings must be natural. Oleoresins and other spice extracts are not permitted.

- Whole hog sausage--§319.144

When this designation is used, the product is prepared from fresh or frozen boneless pork in the proportion that is normal in a single animal. In a whole hog sausage, hams, loins, and all other primal cuts must be included. The fat content is limited to 50% total fat in the finished product. Water and ice may be used at a 3% level based on total ingredients. *This is the only pork sausage product where limited use of pork byproducts is permitted* (i.e., pork hearts, cheeks, and tongues are acceptable). Feet, snouts, and ears are not acceptable byproducts.

However, the amount of byproducts used cannot exceed natural proportions in a single animal. In this case, one heart, one tongue, and two cheeks would be allowed per animal. Mechanically separated pork product is permitted when it comes from whole animals used in the production.

Breakfast Sausage--§319.143

This product is prepared with fresh and/or frozen meat or fresh and/or frozen meat and meat byproducts, and may contain mechanically separated (species) product at a 20% level based on the total meat and meat byproduct portion of the formula.

Breakfast sausage may contain binders and extenders at a 3.5% level based on the finished product, except where lower levels are required by §318.7 of the Regulations (e.g., ISP 2%). Binders and extenders are used in breakfast sausage to improve the texture of the product and to extend or expand the product (increase the yield). This product may contain more than one species of meat and meat byproduct. The fat content is limited to 50% in the finished product. To facilitate chopping and mixing, water and ice may be used in an amount not to exceed 3% of the total ingredients. Paprika is not permitted.

Fresh Beef sausage--§319.142

This is a sausage product prepared with fresh or frozen beef, or both. No beef byproducts are permitted, but it may contain mechanically separated beef at a 20% level based on the total meat portion of the formula. The finished product shall not contain more than 30% total fat. (This compares with 50% for fresh pork and breakfast sausages.) To facilitate mixing and chopping water and ice may be used up to 3% based on the total ingredients.

Binders and extenders are not permitted. Approved condimental substances may be used in amounts as provided for in §318.7(c)(4). Paprika is not permitted.

Italian Sausage--§319.145

Although Italian sausage is classified as a fresh sausage, it may be cured or uncured. For this reason it is not labeled as "Fresh Italian Sausage." When it contains sodium nitrite or potassium nitrite at a level not to exceed $\frac{1}{4}$ oz per 100 pounds of meat (allowed by regulation), it must be labeled as "Cured Italian Sausage." This product must have at least 85% meat or a combination of meat and fat, but the fat content must not exceed 35% total of the finished product. Water and ice may be used for mixing and chopping, but must not exceed 3% of the total ingredients, including water. The product may contain approved condimental substances, **including paprika**. The paprika in this product is considered a flavoring, although it has very few flavoring qualities. It is used mainly for the effect it has on the color and appearance of the product. The product must contain salt, pepper, and either fennel or anise, or a combination of fennel and anise. This product may contain the following optional ingredients: red or green peppers or both; dehydrated or fresh onions, garlic, and parsley; sugar, dextrose, corn syrup,

corn syrup solids, glucose syrup; monosodium glutamate and antioxidants. Corn syrup, corn syrup solids, and glucose syrup are used for flavoring. Mechanically separated pork is permitted at a level of 20% of the pork or pork and pork fat being used in the formula.

Italian sausage may be produced and labeled in several different ways depending upon the ingredients used.

- Italian Sausage

This designation is for product prepared with fresh or frozen pork or pork and pork fat.

- Italian Sausage with Beef--pork, with beef or beef and beef fat.
- Italian Sausage with Veal--pork, with veal or veal and veal fat.
- Italian Sausage with Beef and Veal

These designations are used when the fresh or frozen *pork* constitutes the major portion of the meat content requirement.

- Italian Beef Sausage or Kosher Italian Beef Sausage

This designation applies when the product is prepared with fresh or frozen *beef or beef and beef fat*. Italian Veal Sausage or Kosher Italian Veal Sausage would be designated as such when the product is prepared with fresh or frozen veal or veal and veal fat.

- Cured Italian Sausage

This designation applies when sodium nitrite or potassium nitrite is used in the formulation.

At times Italian sausage may be cooked. If any of the above listed products are cooked, smoked, or smoked and cooked, the water is limited to 3% of the total ingredients at the time of formulation. When the product is cooked or smoked, the product name must reflect the process in the following manner:

- Cooked Italian Sausage
- Smoked Italian Sausage
- Cooked Cured Italian Sausage

This procedure will be used for all other Italian sausage products with different characteristics.

Bratwurst (Fresh)

Bratwurst is German for pork sausage, but in some of the products, a combination of meats is used. The product has changed somewhat from its original formulation. The original product contained lemon rind or lemon juice as a flavoring agent. This is not true of today's formulations. This product is prepared with fresh, uncured, uncooked, unsmoked meat (predominately pork). Water and ice may be used at a level of not more than 3% of the total ingredients at the time of formulation. Extenders may be used at a level up to 3.5% of the finished product. There is no fat limitation for this product. As a sausage, it may not contain byproducts, eggs, milk, vegetables, or cheese.

Bratwurst may be made with poultry. Poultry bratwurst has the same requirement as bratwurst and may contain beef fat without limitation when properly identified in the product name, e.g., Turkey and Beef Fat Bratwurst.

FRESH POULTRY SAUSAGE

Sausage products made from poultry must be labeled to indicate the kind of poultry, e.g., "Chicken Sausage" or "Turkey Italian Sausage." Products containing more than one kind of poultry or red meat must declare the added ingredient in the product name, e.g., "Chicken Sausage Links, Beef Added." The basic sausage standards per §319.140 also apply to poultry.

Ground poultry product for use in sausage labeled "(Kind) Meat," for example, "Chicken Meat" or "Turkey Meat," must not contain skin, added fat, kidneys, or sex glands. Product that contains skin would be labeled "Chicken."

ANTIOXIDANTS

Without a stabilizer added to the formulation, a fresh sausage rapidly deteriorates under normal conditions. Therefore, antioxidants are approved for use in **all** fresh sausage products to retard rancidity and protect the flavor. These compounds are normally added to the spice mixtures with instructions on how much of the mixture to use in the formula. The danger is that these mixtures are usually formulated using the maximum amount of fat by regulation (50%) as the basis for the directions. However, the product as formulated may contain less fat than the maximum allowed. The amount of antioxidants (0.01% or 0.02% in combination) must be based on the percentage of fat in the product formulation, not on the maximum fat allowed by regulation.

Note: Antioxidants approved for fresh sausage are butylated hydroxytoluene (BHT), butylated hydroxyanisole (BHA), propyl gallate, tertiary butylhydroquinone (TBHQ), and tocopherols (recently approved at a level of 0.03%, but they cannot be used in combination with other antioxidants).

TREATMENT FOR THE DESTRUCTION OF LIVE TRICHINAE

The provisions of §318.10 of the Regulations require that pork muscle tissue be treated for the destruction of live trichina in cases where there is a possibility that the product will be consumed without being thoroughly cooked. There are conditions when pork muscle tissue does not require treatment because of normal handling and cooking methods. The guidelines for determining when a fresh or uncooked product is required to be treated for the destruction of live trichina are outlined in FSIS Directive 7320.1.

- Product prepared from only pork muscle tissue, and containing no ingredients that would mask the product appearance, would not require treatment for the destruction of trichinae. This would include such products as fresh pork sausage and whole hog sausage in links, chubs, or patties.
- Sausage and sausage-like products containing pork muscle tissue and other meat or poultry products not requiring treatment for the destruction of trichinae are:
 - ▶ Products with a diameter of 1 inch or less. (This is the normal sheep casing size.) These products are adequately cooked by the consumer to destroy trichinae.
 - ▶ Products stuffed in chubs and labeled with the word “pork” in the product name (e.g., pork sausage chubs). These products are designed to be sliced and cooked as patties or have their casings removed and be added to other products that will be thoroughly cooked.
- Sausage and sausage-like products containing pork muscle tissue and other meat or poultry products that require treatment for the destruction of trichinae are:
 - ▶ Products with a diameter of over 1 inch (other than chubs as listed above). This would include products with a mixture of pork and other meats or poultry in hog-casing size or larger.
 - ▶ Products containing wine or cure.
 - ▶ Products that are cooked or smoked.
 - ▶ Products containing red peppers, paprika, excess sugar, or other ingredients that impart a color to the product.
 - ▶ Products containing unusual ingredients such as eggs or tomatoes.

If the IIC is unsure whether or not a product requires treatment for the destruction of trichinae, he/she should contact the Technical Service Center.

SAMPLING OF FRESH SAUSAGE PRODUCTS

Inspection program employees must routinely verify compliance with the added water limitation set forth in MPI Regulations, §319.140, at the time of formulation, as directed through the scheduling of procedure 04B04. Guidance for determining compliance with the added water limitation in fresh sausage is provided in FSIS Directive 7140.3.

The inspection program employee may, after concurrence with his or her immediate supervisor, submit three randomly selected 1-pound samples for laboratory analysis when procedure 04B04 has not been scheduled or performed for 4-6 weeks **AND** the added water limitation cannot be determined at the time of formulation. If product is sampled, the inspection program employee should record procedure code 05B02, Directed Sampling, on FSIS Form 5400-3, the blank Procedure Schedule.

During product sampling, a lot will be defined as product from one day's production, unless the establishment normally conducts more than one shift during a day, in which case a lot is all product from that shift only.

If product is sampled:

- The inspection program employee should record procedure code 05B02, Directed Sampling, on FSIS Form 5400-3, Procedure Schedule.
- Each of the three samples should be accompanied by a separate FSIS Form 10,600-1, Domestic Chemical Lab Analysis. In Box 21, indicate that the product is suspected of containing excess water and check the "Added Water" block in item number 25.
- The inspection program employee will average the results of the three samples. When the average of the three samples is:

$\geq 4\%$ (if water is declared)

or

 $\geq 1\%$ (if no water is declared)

He or she shall:

- ▶ Retain the lot represented by the initial three samples if the lot has not been shipped from the establishment,
- ▶ Advise establishment management that the establishment is now under a "Hold and Test Restriction",
- ▶ Retain and submit three samples collected randomly from the next available lot produced by the establishment,

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- ▶ Release the retained lot if the average of the three samples is 3% or less if water is declared; or 0% or less if no water is declared, and
- ▶ Continue operating under the "Hold and Test Restriction" until the average of the three sample results from three consecutive lots is found to be in compliance. At that time, the inspection program employee shall return to normal verification by determining compliance at the time of formulation as directed by the scheduling of procedure 04B04.

Inspection program employees should consult their immediate supervisors if further guidance is needed when determining compliance with the added water limitation in fresh sausage.

The compliance for fat is determined on the basis of not exceeding the maximum amount allowed. There is no tolerance for fat content. Procedure 05B01 is performed when a sample of fresh sausage is selected and submitted to the laboratory for fat content analysis.

FRESH SAUSAGE ALLOWABLE INGREDIENTS

	Fresh Pork	Whole Hog	Breakfast	Fresh Beef	Italian	Bratwurst
Antioxidants	Yes	Yes	Yes	Yes	Yes	Yes
Mechanically Separated Species	20%	20%	20%	20%	20%	20%
Water/Ice	3%	3%	3%	3%	3%	3%
Fat	50%	50%	50%	30%	35%	No limit
Binders/ Extenders	None	None	3.5%, 2.0%	None	None	3.5%, 2.0%
Paprika	None	None	None	None	Yes	None
Byproducts	None	Natural Proportions	Yes	None	Yes	None
Nitrite	No	No	No	No	No*	No
Meat or Meat/Fat Content					85% Minimum	

*If curing agents are added to Italian Sausage, the product would have to be labeled as “Cured Italian Sausage”.

SUPPLEMENT

Title: Fresh Sausage Operations

Resources: MPI Regulations,
FSIS Directives,
Processing Inspectors' Calculations Handbook (FSIS Directive 7620.3)

Sections: 1. Inspection System Procedures
2. Calculations for Fresh Sausage Formulas

Purpose: These inspection procedures and calculations will provide the inspection program employee with sufficient background to accurately determine product compliance, and initiate various controls and actions when verifying fresh sausage regulatory requirements.

Note: For the purpose of these supplement problems, an answer to 2 decimal points will be acceptable.

(Do not round up when calculating restricted ingredients.)

Part 1: Inspection System Procedures

Whether meat and poultry products are in compliance with MPI regulations is often determined by how the products are formulated and processed. Careful attention to the type and amount of ingredients, their conditions of use, and product standards of identity or composition are necessary to ensure compliance. The regulations provide specific information on the permitted amounts and uses of various ingredients that can be used in the preparation of meat and poultry products. The regulations and policy memorandums also prescribe definitions and standards of identity, or composition, for certain meat and poultry products. Standards of identity set specific requirements for a product's make-up. For instance, a product standard of identity may specify the kind and amount of meat or poultry, the maximum amount of a non-meat or non-poultry ingredient, and any other ingredients allowed, or expected, in the final product.

Procedure 04B01

*Inspection program employees perform **procedure 04B01** to determine the compliance of an ingredient that **must** be added to a product's formulation in a specified amount or percentage or be in the finished product in a specified amount or percentage.*

For example, fresh Italian sausage products **must** contain at least 85% meat, or a combination of meat and fat, with the total fat content constituting not more than 35% of the finished weight. Inspection program employees will determine if the meat, or combination of meat and fat, is 85% or more of the product's formulation during the performance of procedure 04B01. Since the percentage of fat in the finished product must be determined through laboratory analysis, the 35% maximum fat content limit **cannot** be verified while performing procedure 04B01. The fat content of Italian sausage and other fresh sausage products that have a fat content limit in their standard of identity is verified through the performance of procedure 05B01, economic sampling.

Procedure 04B04

*Inspection program employees perform **procedure 04B04** to verify general labeling regulatory requirements and determine if the label accurately reflects the finished product.*

The regulations and many product standards of identity allow the establishment to add various ingredients to the formula of certain meat and poultry products. Some ingredients have a specified maximum amount or percentage. These ingredients are called **restricted** ingredients. The plant **may** add the ingredient in any amount up to its permitted limit. When the inspection program employee

performs 04B04, he or she will select one or more batches of product during formulation and determine the amount or percentage of one or more restricted ingredients used in the formula. Noncompliance occurs only when the ingredient order of predominance on the label is affected or the ingredient exceeds the permitted amount.

To perform procedures 04B01 and 04B04, there are certain steps or processes to follow. The following could be a typical product formula.

Example 1

Fresh Pork Sausage, BHA added to protect flavor

Ingredients: Pork, water, salt, sugar, spices, BHA

Sausage Formula (Batch)

Regular pork trimmings	(60% fat)	280.00 lb
Special pork trimmings	(30% fat)	156.00 lb
Water		15.00 lb
Hunts Fresh Sausage Seasoning		<u>9.00 lb</u>
		460.00 lb total batch weight

Note: This product is formulated to yield a finished product with a fat limit of 40%.

Hunts Fresh Sausage Seasoning:

Salt	5 lb
Sugar	2 lb
Black pepper	15 oz
Sage	11 oz
Nutmeg	5.64 oz
BHA (antioxidant)	<u>0.36 oz</u>
9.0 lb	

Directions: Use one bag to each 460-pound batch of pork sausage.

Note: When used according to directions, the seasoning complies with government requirements for BHA.

Things to check for in this product formula:

1. Does the added water comply with the added water limit for this type of product?
2. Is the intended fat requirement met, based on calculated fat total?
3. Is the antioxidant in compliance with the regulatory limit in this type of product?

Determining the Added Water Content

Given: Total amount of the ingredients is 460 pounds.

Subtract the amount of water in the formula.

Subtract the allowed percentage of water from 100%.

$$\begin{array}{rcl} 460 \text{ lb} & (100\%) & \\ - \quad 15 \text{ lb} & (3\% \text{--water limitation}) & \\ \hline 445 \text{ lb} & (97\% \text{--formula less water}) & \end{array}$$

Divide the formula weight minus water (445 lb) by the percentage of the formula this figure represents (97%).

$$445 \div 0.97 = 458.76 \text{ lb (total amount of product with the addition of 3\% water)}$$

Subtract 445 from 458.76

$$\begin{array}{rcl} 458.76 \text{ lb} & (100\%) & \\ - \quad 445.00 \text{ lb} & (97\%) & \\ \hline 13.76 \text{ lb} & (3\%) \text{ water permitted} & \end{array}$$

OR multiply 458.76 by 3%

$$\begin{array}{rcl} 458.76 \text{ lb} & & \\ \times .03 & & \\ \hline 13.76 \text{ lb of water permitted} & & \end{array}$$

The answer to the second question is NO, the added water is in excess of 3% that is allowed in this product.

Determining the Fat Content (for subsequent antioxidant determination)

Look first at what is given:

40% target fat level in the finished product.

Special pork trimmings contain 30% fat.

Regular pork trimmings contain 60% fat.

Total number of pounds in the meat portion of the formula is 280 lb + 156 lb
or 436 lb

Step 1. Determine the amount (in pounds) of fat permitted in the total formula.

$$\begin{array}{r} 460 \text{ lb (batch weight)} \\ \times 0.40 \text{ (40\%)} \\ \hline 184 \text{ lb fat permitted} \end{array}$$

Step 2. Determine the amount of fat that is being added in the meat portion of the formula.

$$\begin{array}{r} 280 \text{ lb (regular pork trimmings)} \\ \times 0.60 \text{ (60\%)} \\ \hline 168 \text{ lb fat added} \end{array}$$

$$\begin{array}{r} 156 \text{ lb (special pork trimmings)} \\ \times 0.30 \text{ (30\%)} \\ \hline 46.8 \text{ lb fat added} \end{array}$$

$$\begin{array}{r} 168 \text{ lb} \\ + 46.8 \text{ lb} \\ \hline 214.8 \text{ lb total fat added} \end{array}$$

Step 3. Compare total fat added with fat limit in the formula.

$$\begin{array}{r} 214.8 \text{ lb being added} \\ - 184 \text{ lb allowed} \\ \hline 30.8 \text{ lb over} \end{array}$$

Step 4. Determine level of fat in the finished product.

$$214.8 \div 460 \text{ (batch weight)} = 0.4669 \times 100 = 46.7\% \text{ fat (as formulated) in the finished product.}$$

Note: Although this batch of pork sausage has not been formulated to meet the establishment's targeted fat content of 40% in the finished product, it is still in compliance because the fat content has not violated the maximum fat content

allowed in the finished product (50%). Even if the inspection program employee's fat content calculation showed that this batch of pork sausage was formulated with a fat content above 50%, the calculation can only be used as an indicator of the establishment's noncompliance with the pork sausage standard. A fat standard noncompliance at the time of formulation should be confirmed through laboratory analysis. Regulatory action for a fat content noncompliance *must* be based on the laboratory result.

Antioxidant Determination

To verify the compliance of a restricted ingredient that has a regulatory limit based on the fat content of the product, e.g., an antioxidant, inspection personnel must be able to calculate the amount of fat in the product. A product's laboratory fat analysis history or the establishment's target fat content for the product is used as the basis for determining the maximum level of antioxidants allowed in the product. If a product has less fat in it than its targeted fat content, but the antioxidant level is based on the targeted fat content, the product is out of compliance for antioxidants.

In this determination, we used the *target amount* of fat in the formula as if it had been found to be correct. In reality, we would use the computed amount of fat in the formula if it were not in violation of the fat limitation given in the product standard.

Given: The amount of BHA in the seasoning mix (0.36 oz)
The percentage of fat in the finished product (40%)

Determination of the amount of fat in the product--multiply the total amount of finished product by the percentage of fat in the product.

$$\begin{array}{r} 460 \text{ lb (batch weight)} \\ \times 0.40 \text{ (40\%--fat content)} \\ \hline 184 \text{ lb (the amount of fat in the finished product)} \end{array}$$

Multiply the amount of fat by the amount of antioxidant permitted by regulations (0.01%)

$$\begin{array}{r} 184 \text{ lb} \\ \times 0.0001 \text{ (0.01\%)} \\ \hline 0.0184 \text{ lb of BHA permitted} \end{array}$$

Convert the pounds of antioxidant to ounces (16 oz/pound)

$$\begin{array}{r} 16 \text{ oz} \\ \times 0.0184 \text{ lb of BHA permitted} \\ \hline 0.294 \text{ oz of BHA permitted (0.29 oz)} \end{array}$$

The answer to the third question is "NO," the antioxidant is not in compliance--it is in excess of the permitted amount.

Example 2

Breakfast Sausage

Ingredients: Pork, beef, mechanically separated beef, water, soy flour, seasonings and flavorings

Formula: (For a finished product with 50% fat)

Pork trimmings	(60% fat)	300.00 lb	
Beef trimmings	(30% fat)	110.00 lb	
Mechanically separated beef	(30% fat)	50.00 lb	
Water and ice		20.00 lb	
Soy flour		15.00 lb	
Flavorings and seasonings		<u>5.00 lb</u>	
		500.00 lb	total batch weight

Check for compliance of:

1. Mechanically separated beef (MSB)
2. Water
3. Extenders and binders

Mechanically Separated Beef Determination (20% permitted)

Pork trimmings	300 lb	
Beef trimmings	<u>110 lb</u>	
Total	410 lb	(without MSB = 80% of meat portion of the formula)

$410 \div 0.8$ (80% represents the meat portion of the formula without the MSB)

$410 \div 0.8 = 512.5$ lb when 20% MSB is added

512.5 lb

X 0.2 (20%--MSB limitation)

102.5 lb of MSB permitted (50 lbs. being used)

Shortcut method

Total MSB added to the product divided by the meat and meat byproduct

50 (lb in formula) divided by 460 lb (including MSB)

$50 \div 460 = 10.86\%$ being used in the formula (in compliance)

Water and Soy Flour (Binder) Determination

Total formula batch is 500 lb (100%)

Deduct water - 20 lb (3%)

Deduct soy flour - 15 lb (3.5%)

465 lb (93.5%--the formula less the water and soy

flour)

$465 \div 0.935 = 497.3$ (calculated finished product weight)

497.3 lb

X 0.03 (3% water permitted)

14.9 lb of water permitted

(20 lb being used is 5.1 lb over maximum allowed)

497.3 lb

X 0.035 (3.5% extenders permitted)

17.4 lb of soy flour permitted

(15 lb being used, which is 2.4 lb under maximum allowed)

Part II: Calculations for Fresh Sausage Formulas

Using the procedure outlined in this module, perform the required calculations to answer the questions concerning the following fresh sausage formulas. You may use any reference material available for this exercise.

Exercise I

Make the following determination:

1. Is the added water content in compliance?
2. Would the mixtures of the two pork trimmings produce a product with 40% fat?
3. With the target fat level in the product, would the antioxidant be in compliance?

Special Instructions:

Target fat level is 40% total fat.

Antioxidant, BHT and BHA: 50% of each is present in the amount added to the mixture. (When this occurs, use 0.02% for combination instead of 0.01%.)

Fresh Sausage Formula

Special Pork Trimmings	200 lb (25% lean)
Supreme Pork Trimmings	186 lb (70% lean)
Water and Ice	12 lb
Spices and Flavoring (1% BHA & BHT)	<u>2 lb</u>
	400 lb Total batch weight

(You may use the space below and the following page for calculations.)

Exercise II

Italian Sausage

Formula (Batch)

Pork Trimmings	200.00 lb
Mechanically Separated Pork	100.00 lb
Pork Jowls (Skinned)	90.00 lb
Pork Fat	50.00 lb
Water	15.00 lb
*Spice and Flavoring Mix	15.00 lb
Green Peppers	12.00 lb
Corn Syrup Solids	10.00 lb
Salt	3.00 lb
Paprika	3.00 lb
Dehydrated Parsley	<u>2.00 lb</u>
	500.00 lb Total batch weight

*Spice and Flavoring Mix (15 lb)

Fennel	5 lb
Black Pepper	4 lb
Cumin	3 lb
MSG	3 lb
BHA	0.11% of Mix

For this exercise, consider the following:

1. Pork Trimmings 20/80% fat/lean ratio
2. Pork Jowls 88/12% fat/lean ratio
3. Mechanically Separated Pork (complies with fat limit for this product)
4. Spice & Flavoring Mix 0.11% BHA

From the formula, make the following determinations:

1. With the ingredients use in this formula, is the name "Italian Sausage" appropriate?

If not, why?

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4. Is the water content of this product in compliance?

5. What is the total fat content of this product?

6. Is the antioxidant (BHA) in compliance with the maximum allowable fat?